AMENDMENTS TO CLAIMS

Please amend claims 3-6, 8, 12-15, 21, 60, 62, 64 and 66, and cancel claims 41, 42, 46, 50, 54, and 58 for pursuit in a divisional application. All pending claims are reproduced below, including those that remain unchanged.

1.-2. (Canceled)

3. (Currently amended): A method for shaping optical elements, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~annulus center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free shaping of [[a]] the surface.

4. (Currently amended): A method for shaping elements out of silicon, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~annulus center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free shaping of [[a]] the surface.

5. (Currently amended): A method for shaping silica glass optics, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~annulus center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free shaping of [[a]] the surface.

6. (Currently amended): A method for shaping aspheric optics, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the

outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~annulus center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free shaping of [[a]] the surface.

7. (Previously presented): The method of claim 21 operating in a subtractive manner.

8. (Currently amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~annulus center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free shaping of [[a]] the surface; and

operating so as not to leave behind a contaminated redeposition layer.

9. (Previously presented): The method of claim 21 using a plume of the plasma.

10. (Previously presented): The method of claim 21 using a plume of the plasma operating as a sub-aperture tool.

11. (Previously presented): The method of claim 21 wherein a plume of the plasma is translated across a workpiece.

12. (Currently amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~annulus center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free shaping of [[a]] the surface; and

monitoring an emission spectrum to determine process rates.

13. (Currently Amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~annulus center of the annular plasma~~ to create at least one reactive species;

using reactive atom plasma processing for the damage-free shaping of a surface; and

using carbon tetrafluoride (CF4) in argon to create the plasma.

14. (Currently amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~annulus center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free shaping of [[a]] the surface; and

using C2F6 in argon to create the plasma.

15. (Currently amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~annulus center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free shaping of [[a]] the surface; and

using sulfur hexafluoride (SF6) in argon to create the plasma.

16.-17. (Canceled)

18. (Previously presented): The method of claim 21 operating in an additive manner.

19. (Previously presented): The method of claim 21 for removing damage introduced by previous process steps.

20. (Previously presented): The method of claim 21 for removing surface roughness.

21. (Currently amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas to create an annular plasma;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~center of an annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species to shape and polish [[a]] the surface.

22.-31. (Canceled)

32. (Previously presented): The method of claim 21, further comprising:

using the at least one reactive species to react with selected materials which comprise the surface.

33.-36. (Canceled)

37. (Previously presented): The method of claim 62 including the step of moving at least one of the plasma and the surface relative to the other.

38. (Canceled)

39. (Previously presented): The method of claim 66 including the step of moving at least one of the plasma and the surface relative to the other.

40.-43. (Canceled)

44. (Previously presented): The method of claim 60 operated at one of above and below atmospheric pressure.

45. (Previously presented): The method of claim 62 operated at one of above and below atmospheric pressure.

46. (Canceled)

47. (Previously presented): The method of claim 66 operated at one of above and below atmospheric pressure.

48. (Previously presented): The method of claim 60 operable on a conductive surface.

49. (Previously presented): The method of claim 62 operable on a non-conductive surface.

50. (Canceled)

51. (Previously presented): The method of claim 66 operable on a semiconductor surface.

52. (Previously presented): The method of claim 60 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.

53. (Previously presented): The method of claim 62 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.

54. (Canceled)

55. (Previously presented): The method of claim 66 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively

in one of an additive mode and a subtractive mode.

56. (Previously presented): The method of claim 60 operated at about atmospheric pressure and at one of above and below room temperature.

57. (Previously presented): The method of claim 62 operated at about atmospheric pressure and at one of above and below room temperature.

58. (Canceled)

59. (Previously presented): The method of claim 66 operated at about atmospheric pressure and at one of above and below room temperature.

60. (Currently amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free shaping of [[a]] the surface to fit a pre-determined contour.

61. (Canceled)

62. (Currently amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

shaping [[a]] the surface deterministically and damage-free with the at least one reactive species to fit a pre-determined contour.

63. (Canceled)

64. (Currently amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

using the at least one reactive species for the damage-free and deterministic shaping of [[a]] the surface by at least one of:

selecting a part of the surface to shape;

selecting a material to shape on the surface; and

controlling the removal rate of a material on the surface under shaping.

65. (Canceled)

66. (Currently amended): A method for shaping surfaces, comprising:

positioning a distal end of a plasma torch in proximity to a surface so that at least one reactive species from the plasma torch affects the surface, the plasma torch including an outer gas inlet tube, an auxiliary gas inlet tube concentrically arranged within the outer gas inlet tube, an inner gas inlet tube concentrically arranged within the auxiliary gas inlet tube, and a load coil arranged at a distal end of the outer gas inlet tube so that the outer gas inlet tube is nested within the load coil;

injecting a plasma gas into the outer gas inlet tube;

applying a current to the load coil to inductively couple a radio frequency (RF) power to the plasma gas;

creating an annular plasma;

injecting an auxiliary gas into the auxiliary gas inlet tube to at least partially shield the inner gas inlet tube from the annular plasma;

injecting ~~a separate flow of~~ a reactive precursor into the inner gas inlet tube ~~center of the annular plasma~~;

exciting the precursor with [[a]] the radio frequency (RF) power via the annular plasma to create the at least one reactive species; and

shaping a surface deterministically and damage-free with the at least one reactive species by at least one of:

selecting a part of the surface to shape;

selecting a material to shape on the surface; and

controlling the removal rate of a material on the surface under shaping.

67. (Canceled)